

PROFESSIONAL MILITARY COMPTROLLER SCHOOL

IDEA PAPER

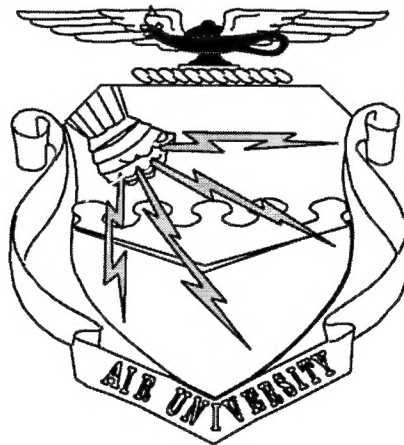
TITLE

Present Value Analysis in the Government

AUTHOR

**Richard A. Snow
GS-12, USAF**

**Class
95-B**



19950406 005

**COLLEGE FOR PROFESSIONAL DEVELOPMENT
AIR UNIVERSITY/UNITED STATES AIR FORCE/MAXWELL AFB, ALABAMA**

DISTRIBUTION STATEMENT A

**Approved for public release;
Distribution Unlimited**

95B-50

This study represents the views of the author and does not necessarily reflect the official opinion of the College for Professional Development, Air University, or the Department of the Air Force.

PRESENT VALUE ANALYSIS IN THE GOVERNMENT

PMCS IDEA PAPER

TITLE: Present Value Analysis in the Government

PMCS CLASS: 95B

AUTHOR: Richard A. Snow **Rank:** GS-12

DUTY ADDRESS: OO-ALC/FMPC **DSN:** 458-1090
7181 Georgia St.
Hill AFB, UT 84041

Executive Summary

Accession For	
NTIS	CRA&I <input checked="checked" type="checkbox"/>
DTIC	TAB <input type="checkbox"/>
Unannounced <input type="checkbox"/>	
Justification	
By	
Distribution /	
Availability Codes	
Dist	Avail and/or Special
A-1	

The basis for this paper is the fact that the government does not invest in long-term financial markets (interest bearing accounts). Financial decisions are to spend money on one project or another depending on total cash outlays of the project, the projected savings, or benefits of the project. Investment in a interest bearing financial instrument for a future expenditure is not a plausible consideration. An opportunity loss from financial markets should not be a major part of the decision making process and is not a "real" financial risk to the Government. Traditionally the Air Force economic and financial analyses have placed too much emphasis on discounted cash flows in the decision making process. Often inflation, borrowing rates, and other "real" cash outlay risks are ignored or the importance is minimized.

Financial Analysis in the Government should focus on the following for financial decision making:

- Current dollar cash flows with a sensitivity analysis accomplished on realistic, optimistic, and pessimistic inflation rates.

PRESENT VALUE ANALYSIS IN THE GOVERNMENT

- Treasury Bill Interest rates should be used to simulate the cost of borrowing money for capital investments (loan amortization).
- Internal Rate of Return and Savings/Investment Ratios should be accomplished on current dollars and not discounted dollars (current or constant).
- Exchange rates should be reviewed when relevant to the project even though financial projections are so dynamic and speculative.
- Constant dollars represent the best present value analysis for Government purposes.
- Discounted cash flows may be presented as shown in AFR 173-15 but should be considered "interesting facts" and not decision making instruments.

This present value discussion does not apply to Non Appropriated Fund (NAF) organizations and other "real" business functions or operations within the Government. When a "realistic" opportunity for investment is available, then present value analysis becomes a relevant financial tool. Total cash flows of a project in current dollars should be the basis for most economic decisions within the Government.

PRESENT VALUE ANALYSIS IN THE GOVERNMENT

TABLE OF CONTENTS

	PAGE
1.0 INTRODUCTION	1
2.0 TIME VALUE OF MONEY (PRESENT VALUE)	2
3.0 AFR 173-15 DISCOUNTING AND PRESENT VALUE POLICY	2
4.0 DISCOUNTING AND FINANCIAL DECISION MAKING	4
5.0 MORE IMPORTANT TIME VALUE OF MONEY RISKS	4
5.1 INFLATIONARY RISKS	5
5.2 INTEREST RATE RISKS (BORROWING INTEREST RATE)	6
5.3 FOREIGN CURRENCY EXCHANGE RATES	7
6.0 SUMMARY AND CONCLUSIONS	8
BIBLIOGRAPHY	9
ATTACHMENT 1, DEFINITIONS	10
ATTACHMENT 2, FUTURE VALUE AND PRESENT VALUE MATH REVIEW	11
ATTACHMENT 3, DISCOUNTING AND FINANCIAL DECISION MAKING	13
ATTACHMENT 4, US TREASURY BILLS - 6 MONTH	14
ATTACHMENT 5, INTEREST RATE IMPACTS	15

PRESENT VALUE ANALYSIS IN THE GOVERNMENT

1.0 Introduction

When I entered the Cost Analysis community I accepted the use of present value techniques (discounting) as a method of analyzing cash flows. I learned this technique in college finance courses and present value analysis is indeed a common business technique for analyzing cash flows. The only problem with using present value in US Government financial analysis is the US Government is not a long-term investor in financial markets (at least not in my life time). The US Government normally manages to spend all the revenue collected within a year and then borrow more. I am not personally aware of any government funds being placed in an interest bearing account to pay for a future project two to 10 years distant. With a multi-trillion dollar national debt and continued deficit spending, enough evidence is available to say the US Government (and Air Force) is a net borrower and not a net investor. (I do recognize that the Government has some involvement in financial markets, both receiving and paying interest.) The basis for this paper is the premise that the government does not invest dollars to collect interest and thus prepare for future expenditures. Plausible financial decisions are to spend money on one project or another depending on total cash outlays, projected operational savings, or derived benefits. An opportunity loss from financial markets should not be part of the decision making process within the Government. (MWR would be an exception and should use discounting.)

This paper is not an analysis of the US Money Supply (i.e., how the Federal Reserve buys and sells government securities and operates in general.) Money supply is an economics discussion outside the scope of this paper.

PRESENT VALUE ANALYSIS IN THE GOVERNMENT

2.0 Time Value of Money (Present Value)

Present value is often used for evaluating the value of cash flows by the time in which the cash is received/dispersed. For example, would you prefer \$100 today or \$127.63 in five years. Of course this depends of the market rate of interest and if the rate is five percent compounded annually, \$100 today and \$127.63 in five years are of equal value in the most simple analysis. (I have intentionally ignored inflation, opportunity costs, tax rates, and other economic factors.) In general, the present value of a sum due in n years in the future is the amount which, if were on hand today, would grow to equal the future sum. Finding present value is simply the reverse of future value or simply stated present value tables are reciprocals of common interest tables (3, 63-68). Present value analysis recognizes the time value of money in interest earning markets. Refer to attachment 2 for a review of present value math.

3.0 AFR 173-15 Discounting and Present Value Policy

Within the Air Force, cash flows have traditionally been analyzed after discounting the cash flows. The yet-to-be replaced Air Force Economic Analysis regulation (AFR 173-15) states: "Discounting is a financial management tool used to determine the value today (present value) of all net resource flows over the life of a program or project. Discounting, or present value analysis, explicitly takes into account the fact that a resource gain or outlay in the future is less valuable than the same sum today, even after adjustment for inflation..." (1, 9). Cash flows are analyzed after discounting constant dollars (unadjusted) or by discounting current dollars (adjusted for inflation) depending on the type of study. Cash flows are normally presented in Format A or Format A-1 as described in AFR 173-15 (1, 23-24). Comparisons are made between discounted cash flows for each alternative considered for a project.

PRESENT VALUE ANALYSIS IN THE GOVERNMENT

The text in AFR 173-15 on discounting certainly describes present value analysis adequately. As described "individuals and organizations can borrow or lend at a positive interest rate" and thus a present value analysis can be a useful management tool for decision making (1, 9). Money can be invested for a future expenditure as a lump sum or as a sinking fund (series of deposits or an annuity) and collect interest earnings. The interest earnings can be used for several types of comparison (i.e., ROI of a project verses interest earnings possible from investing the capital). However, most individuals and organizations have realistic opportunity of investing in an interest bearing account. My theme again is the Government does not have a realistic opportunity to invest money in a long-term interest bearing market.

The text also mentions discounting as a method to offset the opportunity cost of capital for private versus public use. ["The choice of 10 percent is based on estimates of the opportunity cost of diverting physical capital from the private sector into the public sector" (1, 9).] The opportunity cost of public verses private capital does not have any relationship to discounting. There is an opportunity cost to the money supply but it is a stretching financial analysis to say money supply fluctuations are explained by discounting. The major impact would be a tightened money supply and thus a higher rate of interest for the private sector. There is not a relationship between discounting and a higher private sector interest rate or the availability of money to borrow. Opportunity cost to the private sector should be handled in an entirely different financial manner. This analysis should be handled in a "trade off" analysis or a "what if" analysis. For example, if the government constructs an automated warehouse for DoD, hypothetically we will not have capital for an automated warehouse for a private grocery warehouse. (DoD could repair weapon systems at a reduced cost and more efficiently or a

PRESENT VALUE ANALYSIS IN THE GOVERNMENT

corporation could be more efficient and earn more profit.) Quantifying the impacts of such a trade off analysis is difficult but discounting does not account for this private sector opportunity cost.

4.0 Discounting and Financial Decision Making

Again, discounting is a common financial tool used in private sector decision making. In the Government, decision making should be based on a program's projected cash flows or cash outlays. If we make decisions on discounted cash flows, then in many cases we will not select the alternative with the best cash outlay or the alternative that is the most financially advantageous to the Government. Certainly a Government program budget should not be submitted in discounted dollars and financial decisions should not be made using discounted dollars (unrealistic). A case study is provided in attachment 3 to further illustrate this point.

5.0 More Important Time Value of Money Risks

I read an article called "Should Federal Managers Discount Future Costs?" This article lists three main reasons for discounting: 1) risk, 2) inflation, and 3) the productive capacity, or real rate of return, which can be earned if funds are invested in the best alternative (4, 13). First, I do not agree that any Governmental risks are accounted for by discounting a financial analysis since there is no relationship to budgetary requirements/cash outlays and discounted cash flows. Second, inflation is something I would consider a risk to the Government but this risk is accounted for by using current dollars (inflation indexes). Discounting does not have a direct relationship to inflation. Third, productive capacity or the real rate of return from a project are captured by a savings/investment ratio or internal rate of return. Again, discounting has no

PRESENT VALUE ANALYSIS IN THE GOVERNMENT

relationship to a project's benefit or "return" to the Government. The "real" risks to the Government are inflation and interest rates (the borrowing rate of the Government). In the "Carter years", inflation and interest rates were certainly serious financial problems for the Government. During this time, if a budget used historical inflation rates, you can be sure that the organization/program did not have adequate funding since inflation was 13 percent (plus). Long-term borrowing was also a problem for the Government since many investors were receiving 15 percent (plus) on many financial instruments. The Government is forced to compete in the market place to borrow. My position is that the future inflation rate(s) and the future borrowing interest rate(s) are more important financial issues to Government for making decisions. Discounting has no relationship adequately financing the Government.

5.1 Inflationary Risks

As mentioned, inflation is a tremendous risk to the Government since future buying power is unknown. A project may be feasible during a period of two to four percent inflation and infeasible during a period of ten percent inflation. Conversely, deflation could occur in the future making a project more costly today than waiting for several years. (This is stretching my imagination since I have not seen this occur in my life time but anything is possible.) Inflation can and has caused tremendous budgetary problems for the Government.

A recommendation for improving the inflationary risks would be the use of different inflation rates or indexes in a sensitivity analysis. A financial study, project, or program should be modeled for inflation at various rates, especially for commodities that are sensitive to change (i.e., Petroleum, Oil, and Lubricants (POL), energy, precious metals, environmentally hazardous materials, etc.). Inflation impacts simulated in this manner (optimistic, realist, and pessimistic)

PRESENT VALUE ANALYSIS IN THE GOVERNMENT

provide more risk visibility for a manager or analyst. Obviously each alternative would need to be compared using the same inflation rate for each alternative.

5.2 Interest Rate Risks (Borrowing Interest Rate)

Another major risk to the Government is the interest rate required to borrow revenue for operating expenses. An especially risky time is during periods of large deficits. Deficit spending can create large long-term debts at high rates of interest (i.e., the early years of the Reagan Presidency, 1981-1982). (The US Treasury Bill table in attachment 4 displays the fluctuation in Treasury Bill Interest Rates over the last 20 years.) I have yet to complete a study that analyzes the borrowing risk of the program or project. Borrowing rates are less risky in the early years of the project and become more speculative over a long project. Timing is everything in long-term borrowing. When major investments occurred in 1981, a project created a long-term debt problem but if investments occurred in 1993 a project manager will appear "pretty sharp". The impact of interest rates varying from five to ten percent are presented in attachment 5 which displays a potential method of analyzing borrowing risk.

I should note that not all of the Government revenue is financed. However, the portion of the total Federal Government budget used to pay interest on the national debt is growing. For this reason, it is appropriate to view major expenditures (plant, equipment, MCP, etc.) as borrowed capital and consider the interest that would be paid for obtaining this capital in financial analyses. Monitoring the borrowing interest rates would shift our focus from discounting to loan amortizations.

PRESENT VALUE ANALYSIS IN THE GOVERNMENT

5.3 Foreign Currency Exchange Rates

Another major financial risk to the Government is currency exchange rates. If the Government (or Air Force) is purchasing goods and services from foreign entities, the purchasing power of the US dollar is then subject to the currency exchange rate. For example, the Air Force purchased a Peacekeeper missile motor transporter from the Nicholas Company in France. Until this type of contract is definitized and depending on the clauses in the contract, the US Government is subject to buying power changes on a daily basis. During a contracting process like experienced with Nicolas, fluctuations in the Marc to Dollar exchange rate will save or lose millions of dollars for the Government. I have participated in discussions of exchange rates during an Independent Cost Estimate (ICE) briefing but I have not seen a thorough exchange rate analysis. I am not sure there is a good way to analyze this risk in financial studies since the fluctuations in exchange rates are so dynamic. Forward (future) spot rates can be checked but spot rates are very short term. Historical trends can be reviewed but the variance from the average can be extreme in the best of circumstances. A suggestion for projects that involve currency exchanges is a Monte Carlo simulation of relevant exchange rates and a projected impact to a particular program/project.

This subject is mentioned to note that exchange rates do impact programs and cash outlays in a significant manner. Thus exchange rates would be a more important financial consideration to a program than discounting the programs cash flows. Estimating the impact of currency exchange rates is a "crap shoot" but the subject cannot be ignored.

PRESENT VALUE ANALYSIS IN THE GOVERNMENT

6.0 Summary and Conclusions

The basis for this paper is the fact that the government does not invest in long-term financial markets (interest bearing accounts). Financial decisions are to spend money on one project or another depending on total cash outlays, projected savings, or benefits of a project. Investment for a future expenditure is not a plausible consideration. An opportunity loss from financial markets should not be a major part of the decision making process since this is not a "real" financial risk to the Government. Traditionally the Air Force economic analyses have placed too much emphasis on discounted cash flows in the decision making process. Often inflation, borrowing rates, and other "real" cash outlay risks are ignored or the importance is minimized. Total cash flows of a project in current dollars should be the basis for most economic decisions within the Government since investment in financial markets is not a reasonable possibility. Again, this present value discussion does not apply to Non Appropriated Fund (NAF) organizations since a "realistic" opportunity for investment is available.

The Air Force Cost Analysis Agency should focus financial analysis on the following financial subjects:

- a. Current dollar cash flows with a sensitivity analysis accomplished on realistic, optimistic, and pessimistic inflation rates.
- b. Treasury Bill interest rates used to simulate the cost of borrowing money for capital investments (loan amortization).
- c. Internal Rate of Return and Savings/Investment Ratio accomplished in current dollars and not discounted dollars (current or constant).
- d. Exchange rates reviewed when relevant to the project even though financial projections are so dynamic and speculative.
- e. Constant dollars as the best present value analysis for Government purposes and current dollars as the basis for economic decisions.

PRESENT VALUE ANALYSIS IN THE GOVERNMENT

BIBLIOGRAPHY

1. AFR 173-15, *Economic Analysis and Program Evaluation for Resource Management*, March 1988, pp. 9, 23-24.
2. Bingham, Beverly B., et al. *Base Level Cost Analysis Handbook*, The Analytic Sciences Corporation, 9 August 1988, pp 8.1 - 8.60.
3. Brigham, Eugene F.. *Fundamentals of Financial Management*, CBS College Publishing, 1983, pp. 63-68.
4. Clark, Cdr. Rolf H.. "Should Defense Managers Discount Future Cash Flows?" *Defense Management Journal* (March 1978), pp. 12-15.

PRESENT VALUE ANALYSIS IN THE GOVERNMENT

Definitions

Time Value of Money - Money is a commodity which commands a price that gains in value over time as interest accumulates. This fundamental concept is the central idea behind the terms "present value" and "future value". Expressions such as "time is money" and "a dollar today is worth more than a dollar tomorrow" relate to the time value of money. Principles of the time value of money have many applications, ranging from setting up schedules for paying off loans to making decisions about whether to acquire new equipment. In fact, of all the techniques used in finance, none is more important than the time value of money (Business World or Private Sector).

Future Value - The amount to which a payment or series of payments will grow by a given future date when compounded by a given interest (often called compounding). Future value in other words is the value in the future of an investment made today.

Present Value - The value today of a future payment, or stream of payments, discounted at the appropriate discount rate (often called discounting).

Inflation - An increase in the general level of prices or, a general decrease in purchasing power.

Interest Rate - The interest rate which the Government is charged to borrow money for a given period of time.

Constant Dollars - The value, cost, or benefits measured based on constant purchasing power of the dollar. Constant dollar analyses are done from the perspective of a constant general price level, though relative prices may vary.

Current Dollars - The value, costs, or benefits measured based on the incorporation of estimates of future changes in the general price level (inflation) and anticipated changes in relative prices (sometimes called "then year dollars") (2, 8.1 - 8.60; 3, 63-68).

PRESENT VALUE ANALYSIS IN THE GOVERNMENT

Future Value and Present Value Math Review

Since future value and present value are related, let's look briefly at the two financial equations. Let us define some terms as follows:

PV = present value (\$100 for this example)
k = interest rate the bank pays you
I = dollars of interest you earn
 FV_n = future value
n = number of years

In our example, $n = 1$, so $FV_n = FV_1$, and is calculated as follows:

$$\begin{aligned} FV_n &= PV + I \\ &= PV + PV(k) \\ &= PV(1 + k). \end{aligned}$$

We can now use our equation to find how much the account is worth at the end of 1 year.

$$FV_1 = \$100(1 + 0.05) = \$100(1.05) = \$105$$

The account earned \$5 of interest ($I = 5$), so you have \$105 at the end of the year. Now suppose we leave the funds on deposit for 5 years; how much will the account have at the end of the fifth year? The answer is \$127.63; this value is worked out in the following table.

Year	Beginning Amount, PV	X	(1 + k)	=	Ending Amount, FV_n
1	\$100.00		1.05		\$105.00
2	\$105.00		1.05		\$110.25
3	\$110.25		1.05		\$115.76
4	\$115.76		1.05		\$121.55
5	\$121.55		1.05		\$127.63

Notice that the table value for FV_2 , the value of the account at the end of year 2, is equal to $FV_2 = FV_1(1 + k) = PV(1 + k)(1 + k) = PV(1 + k)^2$

Continuing, we see that FV_3 , the balance after 3 years, is

$$FV_3 = FV_2(1 + k) = PV(1 + k)^3$$

PRESENT VALUE ANALYSIS IN THE GOVERNMENT

In general, FV_n , the future value at the end of n years, is found as follows:

$$FV_n = PV (1 + k)^n$$

The future value formula can readily be transformed into a present value formula:

$$FV_n = PV (1 + k)^n$$

which when solved for PV , gives

$$PV = \frac{FV_n}{(1 + k)^n}$$

$$= FV_n (1 + k)^{-n}$$

$$= FV_n \left[\frac{1}{(1 + k)} \right]^n$$

We can now use the present value equation to find out the present value of a future sum at the end of five years.

$$FV_5 = \$127.63$$

$$PV = FV_5 \left[\frac{1}{(1 + .05)} \right]^5$$

$$PV = \$127.63 [1 / 1.05]^5 = \$127.63 (.7835) = \$100.00$$

Year	Ending Amount, FV	$\times [1 / (1 + k)]^n =$	Beginning Amount, PV
5	\$127.63	.7835	\$100.00

PRESENT VALUE ANALYSIS IN THE GOVERNMENT

Discounting and Financial Decision Making

Refer to the Format A and A-1 attachments which contain some sample Formats. Three Format A forms are provided to present some hypothetical cash flows. Presented in the Formats is a XYZ Inc. alternative and a ACME Inc. alternative which have identical recurring cash flows. The major difference is that XYZ Inc. is going to invest in plant and equipment in 1996-1997 and ACME Inc. is going to invest in the same plant and equipment in 2010-2011. Two Format A forms are provided for ACME Inc. to show the non recurring expenditures in constant dollars and in current dollars. The constant dollar non recurring cash flow for ACME Inc. provides and identical cash flow in total to XYZ Inc. (\$459,205,825). However, when the cash flows are discounted, the total cash flows for ACME Inc. are \$198,277,790 and for XYZ Inc. the total cash flows are \$208,034,790. If current dollars are used for the ACME Inc. plant and equipment investment, the discounted cash flow is \$202,976,210 and XYZ Inc. remains the same at \$208,034,790. Whether current or constant dollars are used, a discounted cash flow presents the XYZ Inc. alternative to be the most advantageous to the Government. In this case we find a cost savings of \$5,058,580 using discounted current dollars. These alternatives can also be analyzed in a Format A-1 which would look at the differential cash flows and then discount the differential cash flow.

In the example of XYZ Inc. and ACME Inc., the decision based on the discounted cash flows would be the wrong financial decision for the Government in terms of total cash outlays. In current dollars, XYZ Inc. costs are \$459,202,825 and ACME Inc. costs are \$470,795,825 (\$11,593,000 difference). (We are required to assume the inflation index used is close to reality.) Again, XYZ Inc. and ACME Inc. have identical cash flows in constant dollars. From this example we should see that making a decision based on discounted cash flows would seem absurd if we are considering total cash outlays. Discounting makes the timing of the cash flows the most important financial decision making criteria rather than the projected total costs of the project. In reality, the Government will have to obtain the capital and most likely borrow the capital regardless of the timing of the cash flow. (Budgetary issues and or availability of funding is a different discussion which would certainly plays a part in implementing a project. Budgetary issues are not the "quintessential" factor in financial analysis.) A generally safe statement can be made such as "the Government is not going to invest money currently to pay for a future expense or project".

FORMAT A – SUMMARY OF COSTS FOR ECONOMIC ANALYSIS

1. Submitting Organization:
2. Date of Submission: 04 – Jan – 95
3. Project Title: Minuteman III Guidance Replacement Program
4. Description of Project Objective:
5. Alternative 2 XZY Inc.
6. Economic Life: 22 Years
7. Program/Project Costs:

a. Year	b. Non Recurring	c. Recurring Costs	d. Annual Costs	e. Discount Factor	f. Discounted Annual Cost
1995			\$0	0.9722	\$0
1996	\$12,785,876		\$12,785,876	0.9189	\$11,748,941
1997	\$15,240,701		\$15,240,701	0.8685	\$13,236,549
1998		\$1,851,366	\$1,851,366	0.8209	\$1,519,786
1999		\$5,317,721	\$5,317,721	0.7759	\$4,126,020
2000		\$9,797,106	\$9,797,106	0.7334	\$7,185,198
2001		\$14,897,339	\$14,897,339	0.6932	\$10,326,835
2002		\$15,763,107	\$15,763,107	0.6552	\$10,327,988
2003		\$16,420,597	\$16,420,597	0.6193	\$10,169,276
2004		\$17,093,049	\$17,093,049	0.5853	\$10,004,562
2005		\$17,780,483	\$17,780,483	0.5532	\$9,836,163
2006		\$18,482,913	\$18,482,913	0.5229	\$9,664,715
2007		\$19,200,357	\$19,200,357	0.4942	\$9,488,816
2008		\$19,948,847	\$19,948,847	0.4671	\$9,318,106
2009		\$20,712,382	\$20,712,382	0.4415	\$9,144,516
2010		\$21,490,982	\$21,490,982	0.4173	\$8,968,187
2011		\$22,300,684	\$22,300,684	0.3944	\$8,795,390
2012		\$23,125,480	\$23,125,480	0.3728	\$8,621,179
2013		\$23,981,405	\$23,981,405	0.3524	\$8,451,047
2014		\$24,852,459	\$24,852,459	0.3331	\$8,278,354
2015		\$25,738,661	\$25,738,661	0.3148	\$8,102,531
2016		\$26,656,033	\$26,656,033	0.2975	\$7,930,170
2017		\$27,604,596	\$27,604,596	0.2812	\$7,762,412
2018		\$28,584,357	\$28,584,357	0.2658	\$7,597,722
2019		\$29,579,322	\$29,579,322	0.2512	\$7,430,326
Totals	\$28,026,577	\$431,179,248	\$459,205,825	13.4022	\$208,034,790

8. Uniform Annual Costs:
 - a. Without Terminal Value \$15,522,436
 - b. With Terminal Value \$15,522,436

9. Discounted Total Cost with Terminal Value: \$208,034,790
 - a. Less Discounted Terminal Value \$0
 - b. Net Discounted Total Cost \$208,034,790

10. Source/Derivation of Cost Estimates:
See documentation provided in Alternative 2, Ogden ALC

11. Name, Title, and Phone Number of Principal Action Officer:
Richard Snow / Cost Analyst / DSN 458 – 1090

FORMAT A – SUMMARY OF COSTS FOR ECONOMIC ANALYSIS

1. Submitting Organization:
2. Date of Submission: 04 – Jan – 95
3. Project Title: Minuteman III Guidance Replacement Program
4. Description of Project Objective:
5. Alternative 2 ACME Inc.
6. Economic Life: 22 Years
7. Program/Project Costs:

a. Year	b. Non Recurring	c. Recurring Costs	d. Annual Costs	e. Discount Factor	f. Discounted Annual Cost
1995			\$0	0.9722	\$0
1996	\$2,785,876		\$2,785,876	0.9189	\$2,559,941
1997	\$5,240,701		\$5,240,701	0.8685	\$4,551,549
1998		\$1,851,366	\$1,851,366	0.8209	\$1,519,786
1999		\$5,317,721	\$5,317,721	0.7759	\$4,126,020
2000		\$9,797,106	\$9,797,106	0.7334	\$7,185,198
2001		\$14,897,339	\$14,897,339	0.6932	\$10,326,835
2002		\$15,763,107	\$15,763,107	0.6552	\$10,327,988
2003		\$16,420,597	\$16,420,597	0.6193	\$10,169,276
2004		\$17,093,049	\$17,093,049	0.5853	\$10,004,562
2005		\$17,780,483	\$17,780,483	0.5532	\$9,836,163
2006		\$18,482,913	\$18,482,913	0.5229	\$9,664,715
2007		\$19,200,357	\$19,200,357	0.4942	\$9,488,816
2008		\$19,948,847	\$19,948,847	0.4671	\$9,318,106
2009		\$20,712,382	\$20,712,382	0.4415	\$9,144,516
2010	\$10,000,000	\$21,490,982	\$31,490,982	0.4173	\$13,141,187
2011	\$10,000,000	\$22,300,684	\$32,300,684	0.3944	\$12,739,390
2012		\$23,125,480	\$23,125,480	0.3728	\$8,621,179
2013		\$23,981,405	\$23,981,405	0.3524	\$8,451,047
2014		\$24,852,459	\$24,852,459	0.3331	\$8,278,354
2015		\$25,738,661	\$25,738,661	0.3148	\$8,102,531
2016		\$26,656,033	\$26,656,033	0.2975	\$7,930,170
2017		\$27,604,596	\$27,604,596	0.2812	\$7,762,412
2018		\$28,584,357	\$28,584,357	0.2658	\$7,597,722
2019		\$29,579,322	\$29,579,322	0.2512	\$7,430,326
Totals	\$28,026,577	\$431,179,248	\$459,205,825	13.4022	\$198,277,790

8. Uniform Annual Costs:
 - a. Without Terminal Value \$14,794,421
 - b. With Terminal Value \$14,794,421
9. Discounted Total Cost with Terminal Value: \$198,277,790
 - a. Less Discounted Terminal Value \$0
 - b. Net Discounted Total Cost \$198,277,790

10. Source/Derivation of Cost Estimates:
See documentation provided in Alternative 2, Ogden ALC

11. Name, Title, and Phone Number of Principal Action Officer:
Richard Snow / Cost Analyst / DSN 458 – 1090

FORMAT A – SUMMARY OF COSTS FOR ECONOMIC ANALYSIS

1. Submitting Organization:
2. Date of Submission: 04 – Jan – 95
3. Project Title: Minuteman III Guidance Replacement Program
4. Description of Project Objective:
5. Alternative 2 **ACME Inc.**
6. Economic Life: 22 Years
7. Program/Project Costs:

a. Year	b. Non Recurring	c. Recurring Costs	d. Annual Costs	e. Discount Factor	f. Discounted Annual Cost
1995			\$0	0.9722	\$0
1996	\$2,785,876		\$2,785,876	0.9189	\$2,559,941
1997	\$5,240,701		\$5,240,701	0.8685	\$4,551,549
1998		\$1,851,366	\$1,851,366	0.8209	\$1,519,786
1999		\$5,317,721	\$5,317,721	0.7759	\$4,126,020
2000		\$9,797,106	\$9,797,106	0.7334	\$7,185,198
2001		\$14,897,339	\$14,897,339	0.6932	\$10,326,835
2002		\$15,763,107	\$15,763,107	0.6552	\$10,327,988
2003		\$16,420,597	\$16,420,597	0.6193	\$10,169,276
2004		\$17,093,049	\$17,093,049	0.5853	\$10,004,562
2005		\$17,780,483	\$17,780,483	0.5532	\$9,836,163
2006		\$18,482,913	\$18,482,913	0.5229	\$9,664,715
2007		\$19,200,357	\$19,200,357	0.4942	\$9,488,816
2008		\$19,948,847	\$19,948,847	0.4671	\$9,318,106
2009		\$20,712,382	\$20,712,382	0.4415	\$9,144,516
2010	\$15,560,000	\$21,490,982	\$37,050,982	0.4173	\$15,461,375
2011	\$16,030,000	\$22,300,684	\$38,330,684	0.3944	\$15,117,622
2012		\$23,125,480	\$23,125,480	0.3728	\$8,621,179
2013		\$23,981,405	\$23,981,405	0.3524	\$8,451,047
2014		\$24,852,459	\$24,852,459	0.3331	\$8,278,354
2015		\$25,738,661	\$25,738,661	0.3148	\$8,102,531
2016		\$26,656,033	\$26,656,033	0.2975	\$7,930,170
2017		\$27,604,596	\$27,604,596	0.2812	\$7,762,412
2018		\$28,584,357	\$28,584,357	0.2658	\$7,597,722
2019		\$29,579,322	\$29,579,322	0.2512	\$7,430,326
Totals	\$39,616,577	\$431,179,248	\$470,795,825	13.4022	\$202,976,210

8. Uniform Annual Costs:
 - a. Without Terminal Value \$15,144,992
 - b. With Terminal Value \$15,144,992
9. Discounted Total Cost with Terminal Value: \$202,976,210
 - a. Less Discounted Terminal Value \$0
 - b. Net Discounted Total Cost \$202,976,210
10. Source/Derivation of Cost Estimates:

See documentation provided in Alternative 2, Ogden ALC
11. Name, Title, and Phone Number of Principal Action Officer:

Richard Snow / Cost Analyst / DSN 458 – 1090

FORMAT A-1
SUMMARY OF COSTS FOR ECONOMIC ANALYSIS / PROGRAM EVALUATION STUDIES

1. Submitting Organization:
2. Date of Submission: 04-Jan-95
3. Project Title: Minuteman III Guidance Replacement Program
4. Description of Project Objective:
- 5a. Present Alternative: XYZ Inc. 6a. Economic Life: 22 Years
- 5b. Proposed Alternative: ACME Inc. 6b. Economic Life: 22 Years

Program/Project Costs

7. Year	8. Recurring Costs		9. Differential Cost	10. Discount Factor	11. Discounted Differential
	a. Present Alternative	b. Proposed Alternative			
1995	\$0	\$0	\$0	0.9722	\$0
1996	\$12,785,876	\$2,785,876	\$10,000,000	0.9189	\$9,189,000
1997	\$15,240,701	\$5,240,701	\$10,000,000	0.8685	\$8,685,000
1998	\$1,851,366	\$1,851,366	\$0	0.8209	\$0
1999	\$5,317,721	\$5,317,721	\$0	0.7759	\$0
2000	\$9,797,106	\$9,797,106	\$0	0.7334	\$0
2001	\$14,897,339	\$14,897,339	\$0	0.6932	\$0
2002	\$15,763,107	\$15,763,107	\$0	0.6552	\$0
2003	\$16,420,597	\$16,420,597	\$0	0.6193	\$0
2004	\$17,093,049	\$17,093,049	\$0	0.5853	\$0
2005	\$17,780,483	\$17,780,483	\$0	0.5532	\$0
2006	\$18,482,913	\$18,482,913	\$0	0.5229	\$0
2007	\$19,200,357	\$19,200,357	\$0	0.4942	\$0
2008	\$19,948,847	\$19,948,847	\$0	0.4671	\$0
2009	\$20,712,382	\$20,712,382	\$0	0.4415	\$0
2010	\$21,490,982	\$31,490,982	(\$10,000,000)	0.4173	(\$4,173,000)
2011	\$22,300,684	\$32,300,684	(\$10,000,000)	0.3944	(\$3,944,000)
2012	\$23,125,480	\$23,125,480	\$0	0.3728	\$0
2013	\$23,981,405	\$23,981,405	\$0	0.3524	\$0
2014	\$24,852,459	\$24,852,459	\$0	0.3331	\$0
2015	\$25,738,661	\$25,738,661	\$0	0.3148	\$0
2016	\$26,656,033	\$26,656,033	\$0	0.2975	\$0
2017	\$27,604,596	\$27,604,596	\$0	0.2812	\$0
2018	\$28,584,357	\$28,584,357	\$0	0.2658	\$0
2019	\$29,579,322	\$29,579,322	\$0	0.2512	\$0
Totals	\$459,205,825	\$459,205,825	\$0	13.4022	\$9,757,000

13. Present Value of New Investment:
 - a. Land and Buildings: \$0
 - b. Equipment: \$0
 - c. Other (Equipment Transfer) \$0
14. Present Value of New Investment: \$0
15. Plus: Value of Existing Assets Employed on Project: \$0
16. Less: Value of Existing Assets Replaced: \$0
17. Less: Present Value of Terminal Value of New Investment: \$0
18. Total Value of Investment: \$0
19. Present Value of Savings From Operations: \$0
20. Plus: Present Value of the Cost of Refurbishment or Modification Avoided: \$0
21. Total Present Value of Savings: \$0
22. Savings / Investment Ratio (Line 21/Line 18): ERR

FORMAT A-1
SUMMARY OF COSTS FOR ECONOMIC ANALYSIS / PROGRAM EVALUATION STUDIES

1. Submitting Organization:
2. Date of Submission: 04-Jan-95
3. Project Title: Minuteman III Guidance Replacement Program
4. Description of Project Objective:
- 5a. Present Alternative: XYZ Inc. 6a. Economic Life: 22 Years
- 5b. Proposed Alternative: ACME Inc. 6b. Economic Life: 22 Years

Program/Project Costs

7. Year	8. Recurring Costs		9. Differential Cost	10. Discount Factor	11. Discounted Differential
	a. Present Alternative	b. Proposed Alternative			
1995	\$0	\$0	\$0	0.9722	\$0
1996	\$12,785,876	\$2,785,876	\$10,000,000	0.9189	\$9,189,000
1997	\$15,240,701	\$5,240,701	\$10,000,000	0.8685	\$8,685,000
1998	\$1,851,366	\$1,851,366	\$0	0.8209	\$0
1999	\$5,317,721	\$5,317,721	\$0	0.7759	\$0
2000	\$9,797,106	\$9,797,106	\$0	0.7334	\$0
2001	\$14,897,339	\$14,897,339	\$0	0.6932	\$0
2002	\$15,763,107	\$15,763,107	\$0	0.6552	\$0
2003	\$16,420,597	\$16,420,597	\$0	0.6193	\$0
2004	\$17,093,049	\$17,093,049	\$0	0.5853	\$0
2005	\$17,780,483	\$17,780,483	\$0	0.5532	\$0
2006	\$18,482,913	\$18,482,913	\$0	0.5229	\$0
2007	\$19,200,357	\$19,200,357	\$0	0.4942	\$0
2008	\$19,948,847	\$19,948,847	\$0	0.4671	\$0
2009	\$20,712,382	\$20,712,382	\$0	0.4415	\$0
2010	\$21,490,982	\$37,050,982	(\$15,560,000)	0.4173	(\$6,493,188)
2011	\$22,300,684	\$38,330,684	(\$16,030,000)	0.3944	(\$6,322,232)
2012	\$23,125,480	\$23,125,480	\$0	0.3728	\$0
2013	\$23,981,405	\$23,981,405	\$0	0.3524	\$0
2014	\$24,852,459	\$24,852,459	\$0	0.3331	\$0
2015	\$25,738,661	\$25,738,661	\$0	0.3148	\$0
2016	\$26,656,033	\$26,656,033	\$0	0.2975	\$0
2017	\$27,604,596	\$27,604,596	\$0	0.2812	\$0
2018	\$28,584,357	\$28,584,357	\$0	0.2658	\$0
2019	\$29,579,322	\$29,579,322	\$0	0.2512	\$0
Totals	\$459,205,825	\$470,795,825	(\$11,590,000)	13.4022	\$5,058,580

13. Present Value of New Investment:
 - a. Land and Buildings: \$0
 - b. Equipment: \$0
 - c. Other (Equipment Transfer) \$0
14. Present Value of New Investment: \$0
15. Plus: Value of Existing Assets Employed on Project: \$0
16. Less: Value of Existing Assets Replaced: \$0
17. Less: Present Value of Terminal Value of New Investment: \$0
18. Total Value of Investment: \$0
19. Present Value of Savings From Operations: \$0
20. Plus: Present Value of the Cost of Refurbishment or Modification Avoided: \$0
21. Total Present Value of Savings: \$0
22. Savings / Investment Ratio (Line 21/Line 18): ERR

PRESENT VALUE ANALYSIS IN THE GOVERNMENT

US Treasury Bills - 6 month

Date	Rate		Date	Rate
12/31/75	5.7%		12/31/85	7.1%
12/31/76	5.1%		12/31/86	5.9%
12/31/77	5.8%		12/31/87	6.2%
12/31/78	8.3%		12/31/88	7.5%
12/31/79	10.5%		12/31/89	7.7%
12/31/80	11.0%		12/31/90	7.2%
12/31/81	12.8%		12/31/91	4.9%
12/31/82	10.4%		12/31/92	3.5%
12/31/83	9.0%		12/31/93	3.2%
12/31/84	9.4%		12/31/94	4.6%

PRESENT VALUE ANALYSIS IN THE GOVERNMENT

Looking at the XYZ Inc. and ACME Inc. examples in attachment 3, we can see some differences in the interest the Government would need to pay for the non recurring investments. If the borrowing takes place early in the program, we can avoid borrowing inflated dollars. We can borrow \$10,000,000 instead of \$15,560,000 in the first year of the project. This will save the government \$5,560,000 if the project is ready to be implemented or the technology is currently developed. When paying interest on the borrowed capital, the rate of interest has significant impacts on the program. At seven percent, the early investment will also save \$3,435,470 in interest payments. The impact of interest rates varying from five to ten percent are presented in the interest rate impacts table.

Interest Rate Impacts

Year Borrowed	Amount Borrowed	Interest Rate	Length of Loan	Interest Paid
1996	\$10,000,000	5%	15 yrs	\$4,234,368
2010	\$15,560,000	5%	15 yrs	\$6,588,677
1996	\$10,000,000	7%	15 yrs	\$6,178,917
2010	\$15,560,000	7%	15 yrs	\$9,614,387
1996	\$10,000,000	10%	15 yrs	\$9,342,820
2010	\$15,560,000	10%	15 yrs	\$14,537,420

PMCS WRITING REVIEW

Student: Robert S. ... Seminar 5 Faculty Advisor My ...
 Type of Paper ... Paper Date: 5 Feb 95

GRADED AREAS	DOES NOT MEET STANDARDS (Circle Applicable Response)	MEETS STANDARDS (Circle Applicable Response)
1. INTRODUCTION: Motivator, Thesis Statement, Overview	Incomplete Vague (PMCS HO 610, pages 21-23)	Contains all elements Adequately previews main points
2. ORGANIZATION	Unclear (Tongue and Quill, pages 29-34)	Logically arranged
3. TOPIC SENTENCES	Missing (PMCS HO 610, page 24)	Introduce paragraph subject
4. TRANSITIONS	None Many needed (PMCS HO 610, page 24)	Tie together ideas
5. CONCLUSION: Summary Closure	Missing Incomplete New Data (PMCS HO 610, page 26)	Restatement of position Reemphasizes thesis
6. CLARITY/ GRAMMAR	Unclear wording/sentences Many grammatical errors (Tongue and Quill, pages 35-70)	Clear wording/sentences Correct grammar
7. FORMAT	Many format errors (PMCS HO 601-1 through 4)	Correct format
8. EXECUTIVE SUMMARY (if applicable)	Unclear summary (PMCS HO 601-3, page 10)	Summarizes main points
9. RECOMMENDATIONS (if applicable)	Unsupported (PMCS HOs 601-2 and 3)	Supported by Argument

OVERALL FEEDBACK

Excuse - you, Robert! I'm sorry for the ...
 of the ... (7 pages of attachments).
 You did a good job of making your case but you did ...
 ... who ... take ...
 ... "See me and I'll give you some ..."
 Also read ... 601-4 ... HO (pg 14). Please
 make changes to recommendations before Friday. ... like

"Does not Meet Standards" in Graded Areas 2 or 6-REDO

"Does not Meet Standards" in two other Graded Areas -REDO

P.S. ...

CHECKSHEET FOR IDEA/CURRENT ISSUE PAPERS

PLEASE PRINT THE FOLLOWING DATA:

STUDENT
NAME: Richard Snow ADVISOR: Maj. Hardin

SEMINAR:

* * * CHECKLIST FOR TURN IN * * *

Check () if completed appropriately:

- (/) Idea paper (1 copy) assembled properly:
- () Current Issue paper (1 copy) assembled properly
- (/) Front cover: standard, white printed cover properly completed:
 - (/) Title
 - (/) Name
 - (/) Rank/Grade
 - (/) Service/Agency
 - (/) Class
- (/) Disclaimer (Idea Paper only)
- (/) Executive Summary, numbered per handout 601-3 (Idea Paper only)
- (/) Table of contents, numbered per handout 601-3
- (/) Text (proofed, double spaced, 1 inch margins, copy-ready original.)
Begin text with page #1 and number all pages including attachments and bibliography.
- (/) Do not staple, use a paper clip

NOTE: COMPLETE AND TURN THIS CHECKSHEET SHEET IN WITH ONE COPY OF YOUR IDEA/CURRENT ISSUE PAPER TO YOUR FACULTY ADVISOR.

Atch 2 to HO 601-4

601-4AT2.DOC

PMCS IDEA PAPER INFORMATION SLIP

PLEASE PRINT THE FOLLOWING DATA:

STUDENT NAME: Richard A. Snow RANK/GRADE GS-12
SEMINEAR: 95-B BRANCH OF SERVICE/AGENCY Air Force

(The numbers refer to corresponding computer entries.)

PAPER TITLE: (1) Present Value Analysis in the Government
(80 CHARACTERS)

SUBJECT MATTER AREA (SMA): (2) COST - Economic Analysis
ECONOMIC ANALYSIS
SUB AREA(S): (Optional)

(1) Limit your title to eighty (80) characters (including spaces).

(2) Use the list and follow the guidelines on Atch 3 to this handout.

NOTE: TURN THIS SLIP IN TO YOUR FACULTY ADVISOR WITH YOUR PAPER.

Air Force Students Only:

On the lines below, please PRINT the organization, office symbol, and address of the agency or (OPR) that should evaluate your idea. Atch 4 lists the most common OPRs. If you have a question about this, see your faculty advisor.

ORGANIZATION NAME: Proposal Office
(and/or function)

OFFICE SYMBOL: 00-ALC / FMPC

ADDRESS: 7181 Georgia St.

Hill AFB, UT 84056

Atch 1 to HO 601-4